

## **Historic, Archive Document**

Do not assume content reflects current  
scientific knowledge, policies, or practices.





Reserve  
aSF285  
.35  
.G66  
1990



UNIVERSITY OF  
NEW HAMPSHIRE  
COOPERATIVE EXTENSION  
*Helping You Put Knowledge And Research To Work*



United States  
Department of  
Agriculture

Soil  
Conservation  
Service

New Hampshire  
Department of Agriculture

## GOOD NEIGHBOR GUIDE FOR HORSE-KEEPING: MANURE MANAGEMENT

Carefully-collected animal manure was once the main source of nutrients for crop production. Today, horse owners with one or more animals often don't have enough land for crop production to use the manure their animals produce. Some municipalities require daily or weekly manure removal. Consequently, this valuable by-product is often considered waste or, at best, a disposal nuisance. In New Hampshire, all livestock manure could be used advantageously if it was accessible in a useful form.

Estimates indicate that there may be as many as 30,000 horses in New Hampshire. Ten thousand properties house horses, with millions of dollars being spent on feed and services. Yet all too often potentially valuable manure from these animals ends up in the municipal land-fill and is wasted because it's not available to gardeners, landscapers, and other plant growers in a usable condition. A solution is composting manure or composting manure with other materials such as leaves and lawn clippings that yield organic matter in a form similar to potting soil. Like recycling, composting removes a portion of the municipal waste stream resulting in extended landfill life-expectancy.

### Manure Accumulation and Composition

Each year, a 1000-pound horse can generate eight to ten tons of manure, accumulating at the rate of as much as two cubic feet per day, including bedding. Composition of this material varies depending on the type and quantity of bedding used, age and function of the animal, kind of feed, and how the manure is stored. Typically, a ton of fresh horse manure with bedding would have a nutrient composition of about 13 pounds of Nitrogen [as N], 5 pounds of phosphorous [as P<sub>2</sub>O<sub>5</sub>], and 13 pounds of Potassium [as K<sub>2</sub>O]. Approximately one-half of these nutri-

ents may be available to a crop during a growing season with a spring application. Part of the remaining nutrients will provide fertilizer value in subsequent years. Manure also contains other valuable trace elements. In addition to providing valuable nutrients, manure improves soil texture and soil moisture-holding characteristics, thereby reducing the need for irrigation.

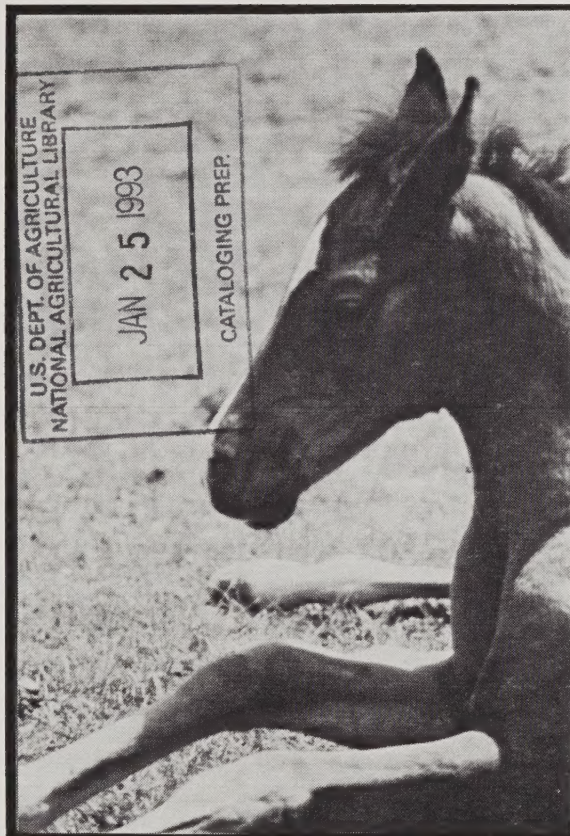
Decomposition of manure starts as soon as it's voided.

Nitrogen is easily lost from horse manure. Decomposition rates depend on handling and storage methods. Horse manure should be kept compact and moist to prevent excessive losses. Manure left in a loose heap loses nitrogen rapidly to the atmosphere in the form of ammonia. Nutrients in urine are readily available for crop use. Bedding used in horse stalls absorbs and holds this valuable component well.

### Manure Storage

A single horse will produce  $\frac{3}{4}$  - 1 cubic foot of manure every day. Bedding can easily bring total volume of material that must be managed each day to 2 cubic feet per animal. Provision must be made for proper handling and storage along with a plan for effective utilization.

While daily removal of manure from the premises might be ideal, it's usually impractical and, contrary to popular belief, it doesn't eliminate fly breeding problems. Adult fly populations within barns can be controlled through use of traps, residual insect sprays, and baiting. Stalls and paddocks should be kept clean and dry. Refuse, scattered hay, and wasted grain about the barn or in the yard can be fly breeding spots if wet. Keeping breeding sites around stalls and feeders at moisture levels below 60% should significantly reduce fly populations. If manure can't be removed weekly in warm weather, a screened





storage area or covering the pile with a plastic tarp could be helpful.

Make adequate storage for manure available—144 square feet of confined storage space will conveniently hold manure from one horse for a year. Accumulation might be 3-5 feet in depth. Large storages should be well-constructed and accessible for use of power equipment. Locate storage sites so loading and unloading is convenient. Create a positive image by storing and handling manure as neatly and inoffensively as possible.

Grade the surrounding area to keep surface water from running over or through the manure and into streams or other surface waters. Covering the manure pile will help prevent liquid from leaching into groundwater. Also keep roof and yard water from draining into the storage area.

Design criteria regulations for new well construction and placement adopted by the New Hampshire Water Well Board on July 2, 1985, "require or recommend that animals should not be penned or tied within a 75-foot protective radius around a water well, particularly if uphill." Owners and managers of horse farms should consult UNH Cooperative Extension and the U.S. Soil Conservation Service about manure storage design and management. They have educators, specialists, and engineers who can provide detailed information on planning a workable, environmentally-sound manure handling system.

## Exercise Runs and Paddocks

Exercise areas or paddocks are assumed to be areas of bare soil, or sand/soil mix with little grass or other vegetation in them. They are simply a fenced, open area for horses to use for outdoor exercise. Horses may be turned out into these exercise areas as often and for as long as the horse owner desires. Management of pastures is much different from management of exercise areas.

An exercise area should be a minimum of 200 square feet per adult horse. For maximum use of a given area, several long, narrow runs are best. Minimum width is 14 feet. Length can be any distance that fits the landowner's plans. Long, narrow runs should be laid out across a slope to minimize soil erosion. Generally, try to avoid slopes greater than 3%. Square areas require less fencing. However, horses like to run along a fence line. Therefore, several long narrow runs will allow separated horses to exercise together without interfering with one another.

Plain board fencing is the most economical. A 2 or 3-board design should be satisfactory. Boards should be attached on the post side next to the horses. Care should be taken to eliminate protruding nail heads or other sources of injury to the horses.

Locate exercise runs or paddocks on fairly level, relatively stone-free, well-drained soils. Footing is improved by spreading sand at least two inches deep on existing soils. Sand should be added as previous applications become mixed with the soil. Sand will also reduce dust, mud, and soil erosion.

***Keep runs and paddocks clean by removing accumulated manure frequently.***

Clean surface water run-off from areas outside of animal exercise areas should be diverted away from these areas and conducted safely to the nearest watercourse or wetland area. Grass filter strips around the edges of an exercise area will greatly reduce any pollutants that might leave the site.

***Consult your county Conservation District people for advice and designs to minimize erosion and potential for pollution from exercise runs and paddocks.***

## Pasture Management

Pasture, while not essential, can provide an inexpensive supply of high quality feed with all the protein, vitamins, and minerals needed by most horses. However, pastures vary greatly in productivity. Pastures that are primarily grass offer excellent early and late season grazing, but are often severely depleted during mid to late summer. Pastures that contain clover may continue to allow reasonable good mid-summer grazing. Pasture production is related to: (1) the number of animals per unit area, (2) vegetative makeup of the sod, and (3) the natural fertility of the soil.

Too often, horse pastures are grazed throughout the growing season without rotation. Ideally with small pastures, the horse should be rotated to a fresh area about every two weeks to break up the cycle of internal parasites. One to two acres of well-managed pasture can support one mature horse during the grazing season with rotation. When the animal is rotated as frequently as every two weeks, the acreage needed could be closer to one acre. Four to five acres of unimproved native grass pasture will support only one mature horse for the entire grazing season.

It's difficult to establish and maintain a dense vigorous sod that will withstand the constant trampling of horses. This is particularly true early in the season when the soil may be soft, or with early grazing following a reseeding. Sod that will stand traffic the best is also sod that's less palatable and less attractive to the horse.

A fertilizer program should encourage legumes, such as shallow-rooted white clovers, as well as grasses. The use of a complete fertilizer such as 10-10-10 will supply nitrogen and potassium to the grasses, and phosphorous will encourage the growth of legumes. The amount of fertilizer needed should be based on soil tests. Soil tests are available through UNH Cooperative Extension offices. Fresh manure should *not* be spread on pastures. Manure that has not been composted will introduce the threat of additional parasites to grazing horses.

## Using Manure As Removed From The Stable

Turning of manure under the soil immediately following



spreading will reduce losses of valuable nutrients, especially nitrogen. Manure spread or piled and left exposed on sloping surfaces is subject to erosion, possibly contributing to nearby water pollution downslope. Never spread manure on frozen surfaces or water-saturated ground. In addition, manure should not be stored in piles on land subject to flooding, or spread and left on the surface until flood season has passed.

Where there is nearby crop land, consider tilling in fresh manure when possible. This saves nutrients and alleviates storage problems. Fresh manure is best used for crops with long growing seasons, and better suited to clay and loam soils. Light or sandy soils benefit the most from applications of aged or composted manure. Portions of the nutrients in manure aren't as readily available for plant food as commercial fertilizer nutrients. However, slow release provides a continuing supply of nutrients with less potential runoff.

Crops grown and harvested annually on one acre of land can easily utilize the nutrients available in the yearly accumulation of manure from a single horse. Large amounts of bedding usually present in manure are low in nitrogen content and high in carbon. A high carbon/low nitrogen ratio ties up nitrogen temporarily until the bedding decomposes. A supplemental source of nitrogen could be needed to offset this nutrient imbalance.

## Composting Manure

Often, horse owners and managers don't have access to enough crop or garden land for good use of valuable manure. Therefore, some form of composting should be considered as a means of enhancing the material for off-site use. Recycling this useful material ensures that naturally-available nutrients are sensibly returned to replace those previously removed by vegetation.

Manure that has been composted generally has a better sale value. However, to compost manure, you must pile it properly, keep it moist, and turn it over several times for 1-2 months. Various techniques can improve and hasten the composting process. Processing methods can be kept simple or be quite sophisticated, depending on the desired condition of the end product and the time needed to complete the composting process.

Decomposition under composting conditions makes the fertilizing value of bedding more available to plants. It changes organic matter into substances that more readily form humus in the soil. Availability of phosphorous is increased and many weed seeds that might be present are destroyed.

Good manure management is essential for horses to be accepted as friendly residential neighbors in increasingly crowded suburban settings. Forty-four percent of horses nationwide are said to be housed on private residential property. A solution to animal manure problems, anticipated or real, is a balanced ecological approach.

## Marketing Manure

Properly composted horse manure could be marketed to home gardeners, nurseries, and crop farmers. Nurseries are the most likely customers for large volumes of less-than-completely composted manure, and tend to prefer shavings as a source of bedding. Finely chopped paper could become an acceptable source of bedding and compost in the near future. Crop farmers within a reasonable distance might use trash-free manure on a yearly basis with suitable arrangement. Home gardeners are a good outlet for smaller quantities of composted or aged manure.

Many gardeners would welcome bulk delivery of uniformly composted manure at prices competitive with other sources of organic matter that may have little fertilizing value. A New York state race track is successfully merchandizing composted horse manure in bags.

Most importantly to nature, every effort should be made to recycle horse manure safely and efficiently as a fertilizer to grow useful crops. Most of the nitrogen, phosphorous, and potassium contained in animal feeds is returned in the manure.

*"Make no mistake, horse manure management is becoming a hot issue in some heavily suburbanized New Hampshire towns, and satisfactory resolution will require cooperation between owners, regulatory officials, and abutting owners."*

— Stephen H. Taylor, Commissioner  
NH Department of Agriculture  
New Hampshire Weekly Market Bulletin  
February 7, 1990



### *Authors and Contributors*

Sally Barney – Specialist, 4-H Youth Development UNH Cooperative Extension	John D. Minnick – Water Quality Coordinator Soil Conservation Service, USDA
Peter Davis – Executive Director, New Hampshire Association of Conservation Districts	Frank Mitchell – Water Quality Team Leader UNH Cooperative Extension
Dr. Nancy R. Deuel – Specialist, Horses UNH Cooperative Extension	Dr. James R. Mitchell – Specialist, Agronomy UNH Cooperative Extension
Francis E. Gilman – Specialist, Agricultural Engineering UNH Cooperative Extension	E. Ann Poole – Assistant Planning Director NPS Program Coordinator Department of Environmental Services State of New Hampshire
John Hodsdon – President, New Hampshire Association of Conservation Districts	Stephen Taylor – Commissioner, New Hampshire Department of Agriculture
Bruce A. Marriott – Solid Waste Team Leader UNH Cooperative Extension	

This project is supported in part by the New Hampshire Department of Agriculture. The material is based on work supported by USDA Extension Service under special project number 89-EWQI-1-9186.

UNH Cooperative Extension and USDA Soil Conservation Service programs and policies are consistent with pertinent Federal and State laws and regulations on non-discrimination regarding age, color, handicap, national origin, race, religion, sex, sexual orientation, or veteran's status.

College of Life Sciences and Agriculture, County Governments, New Hampshire Departments of Resources and Economic Development and Fish and Game, United States Department of Agriculture, and United States Fish and Wildlife Service cooperating. 04/90